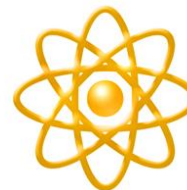




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Risk and Risk Management

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Presentation Overview



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- Learning objectives
- What is risk? How is it determined? How is it managed?
- Senior DOE decision maker's role relative to risks
- Qualitative and quantitative approaches
- Risk Informed Decision approach
- Factors influencing risk management
- DOE organizational behavior factors influencing risk management
- Scenarios for open discussion

Learning Objectives



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- Define risk and how it is analyzed
- Describe the role of the DOE decision maker relative to risk
- Describe the major components of a risk informed decision approach
- Describe the factors affecting DOE risk management



What is risk? How is it determined? How is it reduced?

- Possibility of suffering harm or loss
- Determined by combining the likelihood that an event will occur (i.e., probability) and the consequences of the event if it did occur
- Risks are reduced by mitigation or prevention

For DOE nuclear facilities—different kinds of risks



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- Health and safety; public, workers and environment
- Project cost and schedule
- Public/stakeholder support
- Credibility of Department
- Political support/funding
- Other kinds of risks?

Senior DOE Decision Maker's Role Relative to Risks



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- Safety basis
- Environmental compliance (NEPA)
- Deviations--Exemptions/exceptions (industrial, nuclear, etc.)
- Conflicts between other disciplines and safety
- Others?
- How can risk analysis assist in these functions?

Qualitative approaches



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- Hazard identification/mitigation methods
 - Preliminary Hazards Analysis (PHA)
 - What if/checklist
 - Hazard and operability (HAZOP)
 - Failure Modes and Effects Analysis (FMEA)
 - Others
- Strength, weakness, opportunity, threat
- Others?

Quantitative approaches



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- Accident scenario trees
- Frequency estimates
- Expert elicitations to estimate parameter values and uncertainties
- Probabilistic risks assessments (PRA)
- Uncertainty analysis



Risk Informed Decision Approach

- Definition of issue
- Requirements
- Deterministic Safety analysis results
- Consistency analysis
- Classic decision-making under uncertainty involves risk acceptance, but this is not the same as risk-informed decision-making or risk management



Risk Informed Decision Approach (Cont.)

- Decision process
 - Decision methods
 - Pros and cons
 - Expert judgments
 - Multi-attribute Decision techniques
 - Others

Factors Influencing Risk Management



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- Requirements (compliance)
- Time/urgency to make the decision
- Degree of understanding of the risks/uncertainty (what you know versus what you don't know)
 - High consequence/low probability
- Cost/schedule/programmatic/other impacts and benefits
- Competency of input and decision makers

Factors Influencing Risk Management (Cont.)



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- Degree of defense in depth/safety margins
- Precedents
- Uniqueness of issue
- Other factors?

DOE Organizational Behavior Factors Influencing Risk Management



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- Are DOE's requirements and processes risk informed?
- Is the distinction between requirements and guidance/management prerogative risk informed?
- Is DOE risk averse?
 - Safety risk averse?
 - Program/project risk averse?
 - Budget and authority risk averse?
 - Others?
- Is risk aversion bad?



- **Scenario 1: Conflict of Safeguards and Security requirements with Nuclear Safety requirements**
 - To address the design basis threat, S&S plans on adding significant weaponry on the exterior of your HC 2 nuclear facility.
 - Addition of weaponry will ensure DBT requirements are met; however discharge of weaponry could have catastrophic impacts to safety SSCs



- **Scenario 2: Nuclear safety non-compliance scenario**
 - Discovery of a Hazard Category 3 nuclear facility at your site with no HC 1-3 nuclear facilities
 - Facility has three sealed sources exceeding the Hazard Category 3 thresholds by a factor of 5
 - Sealed source documentation does not exist and sensitive to nuclear issues
 - Public is located 75 meters from facility fence line
 - Very limited nuclear safety expertise at site

Examples (Cont.)



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- **Other Examples**